

But even in the nucleus of a comet as in a star it is much more easy to be certain of the existence of bright lines than to record their exact positions,¹ and as a matter of fact bright lines have been recorded, notably in Comet Wells and in the great comet of 1882.

The main conclusion to which my researches have led me is that the stars now under consideration are almost identical in constitution with comets between that condition in which, as in those of 1866 and 1867, they give us the absolute spectrum of a nebula and that put on by the great comet of 1882.

I am aware that this conclusion is a startling one, but a little consideration will show its high probability, and a summary of all the facts proves it, I think, beyond all question.

While we have bright lines in comets, it can be shown that some of them are the remnants of flutings. Thus in Comet III. of 1881, as the carbon lines died away the chief manganese fluting at 558 became conspicuously visible; it had really been recorded before then. The individual observations are being mapped in order that the exact facts may be shown. It may probably be asked how it happened that the fluting of magnesium at 500 was not also visible. Its absence, however, can be accounted for: it was *masked* by the brightest carbon fluting at 517, whereas the carbon fluting which under other circumstances might mask the manganese fluting at 558 is always among the last to appear very bright and the first to disappear.

In the great comet of 1882, which was most carefully mapped by Copeland, very many lines were seen, and indeed many were recorded, and it looks as if a complete study of this map will put us in possession of many of the lines recorded by Sherman in the spectrum of γ Cassiopeiae. We have then three marked species of non-revolving swarms going on all fours with three marked species of revolving ones, and in this we have an additional argument for the fact that the absence in the former of certain flutings which we should expect to find may have their absence attributed to masking by the carbon flutings.

We have next, then, to show that there are carbon bands in the bright-line stars.

There is evidence of this. Among the bright lines recorded is the brightest carbon fluting at 517. This is associated with those lines of magnesium and manganese and iron visible at a low temperature which have been seen in comets.

But we have still more evidence of the existence of carbon. In a whole group of bright-line stars there is a bright band recorded at about 470, while, less refrangible than it, there appears a broad absorption band. I regard it as extremely probable that we have here the bright carbon band 467-474, and that the appearance of an absorption band is due to the fact that the continuous spectrum of the meteorites extends only a short distance into the blue.

If we consider such a body as Wells's comet, or the great comet of 1882, as so great a distance from us that only an integrated spectrum would reach us, in these cases the spectrum would appear to extend very far, and more or less continuously, into the blue; but this appearance would be brought about, not by the continuous spectra of the meteorites themselves, but by the addition of the hydrocarbon fluting at 431 to the other hot and cold carbon bands in that part of the spectrum.

There are other grounds which may be brought forward to demonstrate that the difference between comets and the stars now under discussion is more instrumental than physical.

Supposing that the cometic nature of these bodies be

conceded, the laboratory work will show us which flutings and lines will be added to the nebula spectrum upon each rise of temperature; and the discussion, so far as it has gone, seems to show that such lines and flutings have actually been observed.

The difficulties of the stellar observations must always be borne in mind. It will also be abundantly clear that a bright fluting added to a continuous spectrum may produce the idea of a bright line at the sharpest edge to one observer, while to another the same edge will appear to be preceded by an absorption band.

III. STARS WITH BRIGHT FLUTINGS ACCOMPANIED BY DARK FLUTINGS.

I also showed in the paper to which reference has been made that the so-called "stars" of Class III.a of Vogel's classification are not masses of vapour like our sun, but really swarms of meteorites; the spectrum being a compound one, due to the radiation of vapour in the interspaces and the absorption of the light of the red- or white-hot meteorites by vapours volatilized out of them by the heat produced by collisions. The radiation is that of carbon vapour, and some of the absorption, I stated, was produced by the chief flutings of manganese.

These conclusions were arrived at by comparing the wave-lengths of the details of spectra recorded in my former paper with those of the bands given by Dunér in his admirable observations on these bodies.¹

The discovery of the cometic nature of the bright-line stars greatly strengthens the view I then put forward, not only with regard to the presence of the bright flutings of carbon, but with regard to the actual chemical substances driven into vapour. From the planetary nebulae there is an undoubted orderly sequence of phenomena through the bright-line stars to those now under consideration, if successive stages of condensation are conceded.

I shall return to these bodies at a later part of this memoir.

IV. STARS IN WHICH ABSORPTION PHENOMENA PREDOMINATE.

I do not suppose that there will be any difficulty in recognizing, that if the nebulae, stars with bright lines, and stars of the present Class III.a are constituted as I state them, all the bodies more closely resembling the sun in structure, as well as those more cooled down, must find places on a temperature curve pretty much as I have placed them; the origin of these groups being, first still further condensation, then the condition of maximum temperature, and then the formation of a photosphere and crust.

We shall be in a better position to discuss these later stages when the classifications hitherto adopted have been considered.

(To be continued.)

THE HITTITES, WITH SPECIAL REFERENCE TO VERY RECENT DISCOVERIES.²

IV.

THOSE who have attempted to decipher the Hittite inscriptions have not always regarded a fact which may be discerned with tolerable facility. The inscriptions from Hamath, and those from Jerablûs or Carchemish, though no doubt deriving their origin from a common source, yet present, as we know them, two distinct types. Symbols usual and frequently repeated on the Jerablûs monuments are wholly absent from those of

¹ "Observations of Comet III., 1881, June 25.—The spectrum of the nucleus is continuous; that of the coma shows the usual bands. With a narrow slit there are indications of many lines just beyond the verge of distinct visibility."—Copeland, *Copernicus*, vol. ii. p. 226.

² "Les Étoiles à spectres de la troisième classe," *Kongl. Svenska Vetenskaps-Akademiens Handlingar*, Bandet 21, No. 2, 1885.

³ Based on Lectures delivered by Mr. Thomas Tyler at the British Museum in January 1883. Continued from p. 562.

Hamath. Other symbols, not difficult to identify as essentially the same, yet assume a form more or less changed. The difference is altogether so considerable that in ancient times the ability to read and fully understand the one type may quite possibly not have involved a facility of perfectly comprehending the other. The difference might be spoken of as one of *dialect*, if that word could be, in this case, appropriately employed. Then, so far as the more considerable monuments in the Museum from Jerablûs or Carchemish are concerned, there is clearly between them a difference in age, and the difference may possibly be very great. As evidence in support of this assertion, I may adduce a symbol which was intended apparently to denote an agricultural implement. When this symbol was given as in Fig. M (1), though probably drawn out of perspective and perhaps already somewhat conventionalized, yet its relation to the actual object would seem to have been not very distant. But when the symbol has become changed in the manner that appears

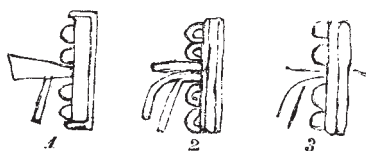


FIG. M.—Symbols of agricultural implements: 1 and 2, from Jerablûs monuments; 3, from incised bowl.

in (2), there is no difficulty in recognizing that a considerable interval must have elapsed. In (3), on an incised bowl, at present deposited in the British Museum, the same symbol has assumed something of a hieratic form. Though the bowl was found at the site of Babylon, the inscription cut into it obviously belongs to the Carchemish type. Possibly the bowl had been brought from Carchemish as a trophy.

It is conceivable that (1) might denote a kind of harrow, but more probably the vertical portion represents the end of a threshing-sledge, with teeth of stone or iron projecting therefrom. It appears to me very doubtful whether this symbol (which is not found on the inscriptions from Hamath) is ever used with any direct reference to agricultural operations. It is rather to be understood figuratively of severity in warfare and of the devastation of an enemy's country. This is in accordance with the usage of the Biblical books, which, on account of local contiguity, have, in relation to the Hittite inscriptions, peculiar importance. Thus we find, in Amos i. 3, "For three transgressions of Damascus, and for four, I will not turn away [the punishment] thereof; because they have threshed Gilead with threshing-instruments of iron"; and there are other similar passages. Moreover, such metaphorical or figurative employment of material symbols is in accordance with what we know of the use of picture-writing by the American Indians. I ought, perhaps, to add that on the Carchemish inscriptions the threshing-sledge is usually accompanied by what is probably the representation of the more essential parts of a plough somewhat conventionalized. Between the pole (or handle) and the



FIG. N.—Probable symbol of plough.

share or tooth, wedges would seem to have been inserted to keep the tooth firm in its place. By an easy metonymy a plough would denote land tilled and cultivated. Fig. N gives this symbol as accompanying Fig. M (2).

The difficulty of explaining the characters of the

Hittite inscriptions may result in part from the objects originally depicted being such as are no longer known to us. But probably a much more serious cause of difficulty is to be found in conventionalization and the changes made to facilitate rapid execution. And we must take into account, in addition, the necessity which would arise in some cases for the lateral compression of the representation, if I may so speak, in order that the symbol might be conveniently given in the same line and in association with other symbols. This last remark applies particularly to a symbol which, there is strong reason to believe, represents the *shadoof*, or instrument for raising water, still used in the East. It would have been inconvenient to represent at full length the lever at top, with a weight at one end, and a bucket, suspended by a cord or



FIG. O.—*Shadoof* symbol, from Jerablûs inscriptions.

chain, from the other. Consequently we have the instrument represented with modification, and with the lever shortened. Here again in all probability the symbol is used for the most part figuratively, and not in general with reference to the raising of water or the irrigation of land. People familiar with the swinging up and down of the lever, and of bringing up the bucket of water, might use the symbol of "raising" in a wider sense, or generally of active and efficient operation. It is probably with this latter meaning that it is employed in three out of the five Hamath inscriptions, and in a combination of symbols which is exceedingly interesting and instructive. Two of the three are represented in Fig. P. As to the general subject, the presence of the hand grasping warlike weapons can scarcely leave a doubt; and in accordance with this indication is the spear-head, however ornamented, at the other end of the figure. The two triangular-topped symbols between, probably denote actual conflict. The idea represented conventionally

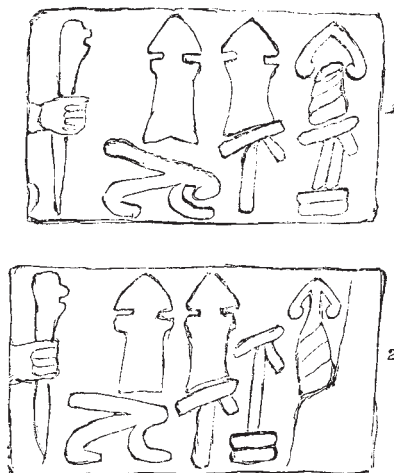


FIG. P.—Groups of symbols ending two Hamath inscriptions.

may be that of a mass of warriors who have closed together in deadly combat, or a mass of spears seen together. Under the first of these triangular-topped figures is a symbol which has been supposed to represent an insect. The two symbols together may be taken as meaning "war commencing." In the second place, we have a combination with the *shadoof*, and we may interpret,

"war in active operation." In the third combination the change in both the symbols is to be noted. That at the top may refer to a custom of enwreathing or adorning the arms of warriors to denote success in war, and to celebrate victory; and the change in the *shadoof* corresponds therewith. In (1) the vertical bar is doubled, and two short horizontal bars are added beneath; in (2) we may take it that the same end is attained by lengthening the vertical bar, while, as before, the two short horizontal bars are added, and the ornamentation of the spear is lengthened. This third combination manifestly marks the climax; but it can only indicate this, if, in accordance with what I have already said, the inscriptions are to be read "with the faces." And very important additional evidence is also furnished by these groups as to the ideographic character of the inscriptions.

That a comparatively primitive people, employing the *shadoof*, the plough, and the threshing-sledge, should use figures of these instruments to represent ideas more or less abstract can scarcely excite surprise. Probably, too, a paucity of symbols might lead to those employed being used to denote a plurality of somewhat diverse significations.

A symbol, with regard to the meaning of which the evidence is especially clear, is the symbol of deity or divinity on the Jerablûs monuments. This symbol consists of a straight stroke and a crescent, denoting in all probability Asherah, "the straight," and the goddess

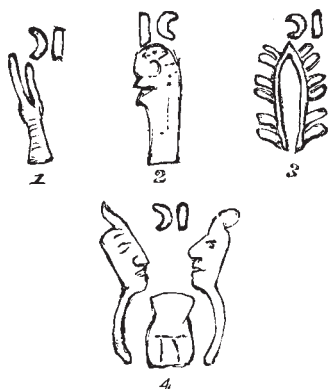


FIG. Q.—The symbol of deity, with various figures on Jerablûs monuments.

Ashtoreth. Such a combination would accord with the close relation between Asherah and Ashtoreth in the Old Testament.¹ But, whether this explanation is admitted or not, that the symbol denotes deity or sacredness can scarcely admit of question. In the first place the symbol occurs invariably at the top of the line on the Jerablûs monuments. This fact is itself significant. Then, three times on the "doorway inscription" what are evidently hands, though somewhat conventionalized, are held up towards the symbol in worship, as with the palm upward (1), according to the widely-spread custom, and also, as it would seem, in giving thanks (Fig. T). The symbol is to be seen also above a sacred tree (3), and above a rudely-shaped idol (2), from a fragment found at Jerablûs. This idol may have been a *lusus naturæ*, presenting a distant resemblance to the human face, and but slightly modified by art. And on the rounded pillar from Jerablûs, which bears the most modern, comparatively, of the three considerable inscriptions obtained from this site, we find the same symbol over very curious figures which, as it seems to me, were intended to represent spiritual beings or disembodied souls (4). They are insubstantial εἰδωλα, mere masks as it would appear, and with tail-like prolonga-

¹ Asherah was probably a phallic symbol. This accords with the view of Movers ("Die Phönizier," vol. i. p. 560 *sgg.*), and with that of the Rabbins (cf. 1. Kings xv. 13, and the commentaries thereon).

tions instead of bodies. They are horned, however, and the horn was a sign of dignity and power. On the whole, the evidence of the value of the straight stroke and crescent is, in my judgment, entirely conclusive. I ought to add that this symbol is not found on the inscriptions from Hamath; and thus in all probability is indicated a difference of religious cult.¹

An interesting question presents itself as to whether the names of Hamath and Carchemish can be detected on the inscriptions. In reply it may be stated that the name or symbol of the ancient city on the site of Jerablûs may be pointed out with a good deal of confidence.



FIG. R.—Name of ancient city on Jerablûs monument.

The oval symbol, which appears at the top in Fig. R, in its origin was intended, no doubt, as a plan of a city. A similar oval form, both of the military camp and of the city (Layard's "Monuments of Nineveh," pl. 77), is to be seen depicted on the Assyrian monuments. And, with regard to the Hittite symbol, it is also worthy of note that not only on the Egyptian monuments is there an analogous circular symbol of "city" or "place," but that a similar symbol, with the like meaning, was found in Mexico, both of circular form, and, as it would seem, also oval. For the latter see Brasseur de Bourbourg, "Études sur le Système graphique et la Langue des Mayas," Paris, 1869, vol. i. p. 150. From the Assyrian monuments it appears that fortresses were not uncommonly of angular and quadrilateral form. I therefore take the lozenge-shaped figure to denote the idea of "fortress." Like the "city" symbol it has what we may regard as a road or street crossing it; and it has markings indicating, in all probability, gates, at the other corners. Then, as to the eagle, a question of great interest, if of some difficulty, presents itself. The ancient city on the site of Jerablûs we have identified with Carchemish. As already stated, the name Carchemish has been looked upon as denoting "the fortress of Chemosh." The question then occurs, If the lozenge-shaped figure denotes "fortress," does the eagle denote Chemosh? Whatever may be the etymology of "Chemosh," it is sufficiently probable that Chemosh was, like Baal and Moloch, a solar deity. This, indeed, has been previously suggested. And the sun might very well be represented by the eagle, the bird of the sun. Moreover such a view is not purely hypothetical. As is well known, in ancient Egypt, Horus, the god of the rising sun, was represented by the hawk. Then there is reason to think that, in connection with the solar cult, the eagle was worshipped or regarded as a sacred bird at places in or near the Hittite country, and not very far distant from Carchemish.

Looking, then, upon the eagle and upon the second part of the name "Car-chemish" as both representing Chemosh, there remains no difficulty about the first part of the name, as we find, in Assyrian, *caru*, a fortress—a word found also, with comparatively slight modification, in Hebrew (*kir*).

² There is another sign, **IL**, which, though less frequent, yet appears as if a variant of the sign of deity usual in inscriptions of the Jerablûs type. This sign somewhat puzzled me till, on the coinage of Mallus, in Cilicia, I found the right angle together with the straight stroke, or *asherah*, the equilateral triangle, and the cone. All these were, no doubt, connected with the goddess Astarte, to whose service Mallus seems to have been especially devoted. It is, in all probability, this deity who appears in winged form on the obverse of the coin, which Mr. Barclay V. Head, the eminent numismatist, assigns to a date earlier than 400 B.C. I ought to add that the sign with the right angle, which probably denotes a different aspect or function of the goddess, occurs apparently in the Hamath inscriptions.

With regard to Hamath, though the evidence is weaker, yet probably the city is indicated by a symbol consisting of the vase or receptacle (Fig. S, 1), with the oval character "city" above and the feminine sign below. The word "Hamath" comes very near to one used in Hebrew for a bottle or hugging receptacle.



FIG. S.—Symbols on "doorway inscription" from Jerablûs: 1, vase or receptacle; 2, hand seizing vegetation.

The receptacle in the figure, having three vertical marks, and one or two horizontal marks, is a common symbol on the Jerablûs monuments. Probably, as in the bag previously spoken of (and see Fig. T), the three vertical marks denote objects within the receptacle; we may suppose, pieces of metal used as uncoined money. It seems most likely, however, that the difference in external shape of the receptacles indicates a difference in the nature and value of the contents. The symbol of seizing vegetation is another example of the use of ideograph or picture-writing in these inscriptions. That the thing seized is a plant or herb is sufficiently obvious. And from the accompanying symbols there is reason to think that one of the food-producing cereals, when ripe, is intended.

Treated in accordance with the principles which have guided us, and the conclusions previously expressed, the group of symbols concluding the "doorway inscription" in the British Museum will be found to yield probable and consistent results. Beginning from the reader's left, we have a symbol which, probably deriving its origin from the chase, bears some resemblance to the leg of an animal repeated, but inverted. The inverted position would appropriately represent the total defeat of an enemy,



FIG. T.—End of "doorway inscription" from Jerablûs, in the British Museum.

while the repetition or doubling may be regarded as implying plurality, and perhaps flight. Then follow symbols denoting probably repeated thanksgivings to the gods (notice the doubling of the sign of deity). Next comes the bag of treasure with the hand beneath pointing towards the king. Under the king's head is a hand in the attitude of acceptance. Here is essentially what we find on the Yuzgât seal, but the object being accepted is not identical with the bag behind the king. Perhaps it denotes the tribute the payment of which was imposed on the conquered people.¹ Then follows the *shadoof* symbol, which here may well imply the vigorous prosecution of agriculture on the restoration of peace. At the end is the plant with four strokes above it, which may be regarded as signifying that the earth brought forth abundantly, or fourfold.² But whether the interpretation I have thus given is accepted or not, the ideographic character of the group is altogether unmistakable.

Allusion was previously made to the name "Zu-zu," or "Su-su" (see p. 539, note) as possibly occurring on the shortest (excepting mere fragments) of the inscriptions

¹ Having regard to the shape of the symbol, one may be reminded perhaps of the wool which was included in the tribute paid by Mesha of Moab to the king of Israel (II. Kings iii. 4).

² Cf. Amos i. 3 *seq.*, and the Biblical use of "four" and "fourfold."

from Jerablûs in the Museum. In the first line of the inscription is the most important of the places where the name would be thus read in accordance with the conclusions arrived at with regard to the Tarkutimme inscription. In the group there are two smaller cones and one larger, all crossed by horizontal lines. The two smaller cones will represent, as on the Tarkutimme inscription, a people or nation. This coincidence with the Tarkutimme inscription may give credibility to the supposition of still further agreement. The animal's head resting on the double cone will denote the name of the people. The taller cone would probably denote a king or possibly kings, crossed as it is by horizontal lines. A curve passes from the top down near the side of the taller cone, and above are the two strokes repeated and placed at an angle, which would be read "Zu-zu" or

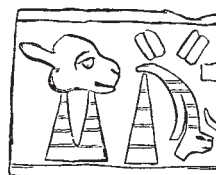


FIG. U.—Group of symbols from Jerablûs monument in the British Museum.

"Su-su." Connected with the curve is an appendage passing to the head of an animal. Across this appendage (and the curve also after the two have become united) pass horizontal lines, probably lines of plurality. The animal's head, with the appendage, may give the name of a royal dynasty or possibly of a subordinate people.¹ But the chief interest attaches to the larger animal's head. In accordance with what was before said, we may regard it as tolerably certain that the name of the people is repeated. If "Zu-zu" is the correct reading of the strokes above the tall cone, the name of the animal whose head rests upon the double cone ought to be essentially the same. To solve the problem, if we are to be consistent, we must have recourse to the Semitic dialects, and preferably to Hebrew. Here we find a rare word, *ziz* (from a root *zuz* or *ziz*), used of an animal browsing sometimes on the vine (Psalm lxxx. 13, A.V.). It would be difficult to determine what particular species of animal is intended either in the Psalm or on the inscription; but it would seem not unsuitable to suppose that young wild cattle are intended in both. It will be in accordance with what has been said to identify "Zu-zu" with the Zuzim described in Genesis xiv. 5, as dwelling in the country east of the Jordan. And indeed, from an ancient city on the site of Jerablûs, a hostile raid on Bashan, Gilead, and the adjacent country was likely enough to be undertaken. Assyriological research has tended to show that Chedorlaomer and some other names in Genesis xiv. are genuine. It would not be very wonderful if the Hittite monuments should show that this is the case also with the name Zuzim.²

The results in decipherment thus set forth are, it may be said, but scanty and imperfect, and, in some cases, as based on slight evidence, may be liable to fall away when a wider induction is attainable. But "all science," it has been said, "is provisional"; and in relation to such a subject as that with which these articles are concerned, it may be sufficient if we should succeed in setting forth just principles, and in making even a slight extension of the boundaries of knowledge.

(To be continued.)

¹ It has been suggested that the smaller animal's head is that of a gazelle. If so, in the plural, the name would be in Hebrew "Tsebaïm" or "Zebouïm," a name found in Genesis xiv. 2, but possibly this would only be a curious coincidence.

² The city indicated on this monument, for the name of which I have suggested "Bamoth-elah" (*ante*, p. 539), may possibly be identical, judging from the ideograph, with Bamoth-in-the-valley of Numbers xxi. 20.